Alternative Approaches to Climate Change Impacts Assessments: Success Stories

Joel D. Scheraga

National Program Director
Global Change Research Program
Office of Research and Development
U.S. Environmental Protection Agency

June 3, 2004

RESEARCH & DEVELOPMENT

Building a scientific foundation for sound environmental decisions

Problem Statement

- Considerable debate about feasibility of conducting regional/place-based climate impacts assessments
- Particular attention given to:
  - accuracy of general circulation models (GCMs)
  - downscaling GCMs to regional scales
  - "cascading uncertainties" through integrated modeling systems
- Purpose of this paper: Dispel misconception that useful climate change impacts assessments can't be done

RESEARCH & DEVELOPMENT

Building a scientific foundation for sound environmental decisions

A User's Perspective

- Taking a user's perspective broadens understanding of array of tools that can be used
- From a user's perspective:
  - Start assessment by eliciting effects of concern (*e.g.*, changes in water quality) to relevant stakeholders (*e.g.*, managers of drinking water systems)
  - Identify questions stakeholders want answered and when
  - Identify appropriate analytic technique
- For a wide range of decisions, predictions are neither necessary nor in some cases appropriate
  - integrated modeling systems are not appropriate
  - alternative approaches are required

"Right model for the right question"

RESEARCH & DEVELOPMENT

Building a scientific foundation for sound environmental decisions

Frequently Asked Questions

- Is climate change potentially an issue of concern?
- Can we better understand the vulnerability of a system to climate change?
- Are there win-win opportunities for increasing resilience to both climate variability and climate change?
- Are there actions that will foreclose future options?
- Can we identify potential maladaptive practices?

RESEARCH & DEVELOPMENT

Building a scientific foundation for sound environmental decisions

Categories of Insights

- Category 1: Effects of concern
- Category 2: Potential vulnerabilities
- Category 3: Win-Win opportunities
- Category 4: Preventing foreclosure of future options
- Category 5: Potential maladaptive practices

RESEARCH & DEVELOPMENT

Building a scientific foundation for sound environmental decisions

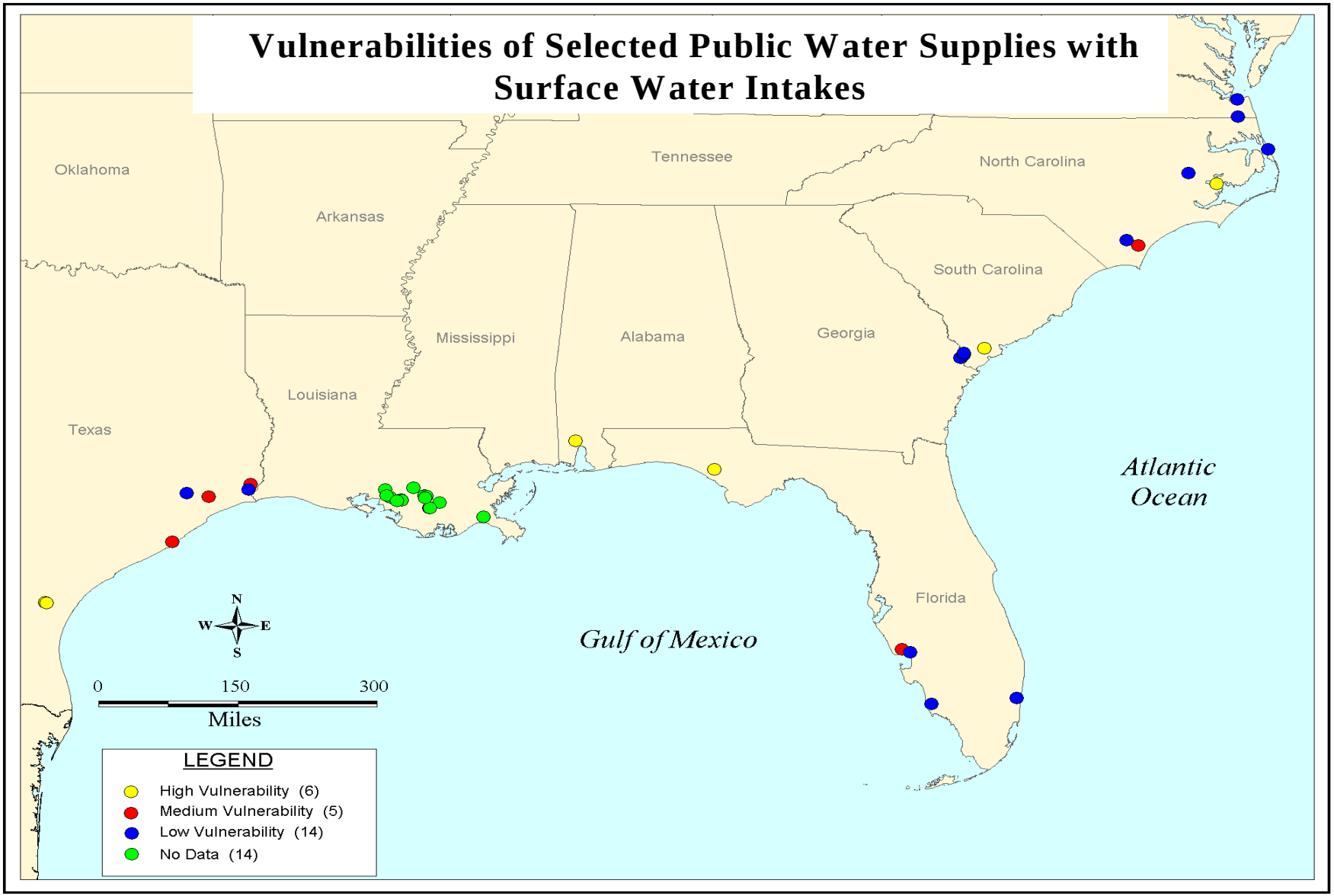
Categories of Insights (cont.)

- Category 1: Effects of concern
  - Why important: Identify where to target further analyses
  - Possible approach: Bounding exercises
- Category 2: Potential vulnerabilities
  - Why important: Identify where to target resources for adaptation
  - Possible approach: Historic analogues
- Category 3: Win-Win opportunities
  - Why important: Increase net benefits of actions to increase resilience to current conditions; insurance for future
  - Possible approach: Analyses of adaptive responses to current climate variability

Categories of Insights (cont.)

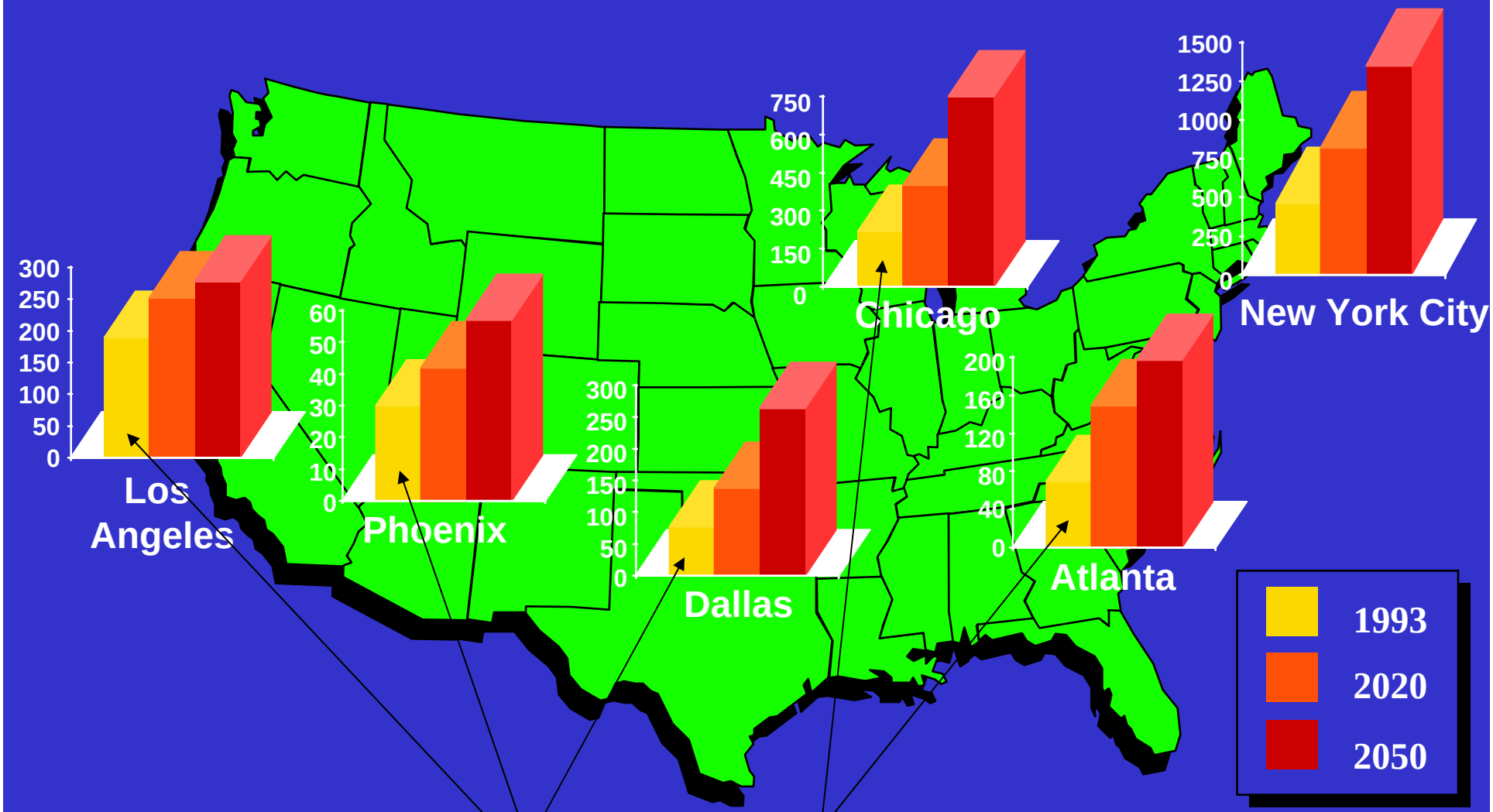
- Category 4: Preventing foreclosure of future options
  - Why important: Permits implementation of flexible policy decisions; increases expected benefits over time
  - Possible approach: Historic analogues combined with "what if" scenarios
- Category 5: Potential maladaptive practices
  - Why important: Avoid unintended undesired effects
  - Possible approach: Historic analogues combined with "what if" scenarios

Category 1: Effects of Concern: Drinking Water



Note: "Cascading uncertainties" are not a concern in this example.

Category 2: Potential Vulnerabilities: Mortality Risk During Heat Waves, 1993



Preventable deaths!

Sources: Kalkstein and Green (1997); Chestnut et al.(1995)

Category 3: Win-Win Opportunities: Riparian Buffer Zones to Protect Water Quality (preliminary results)

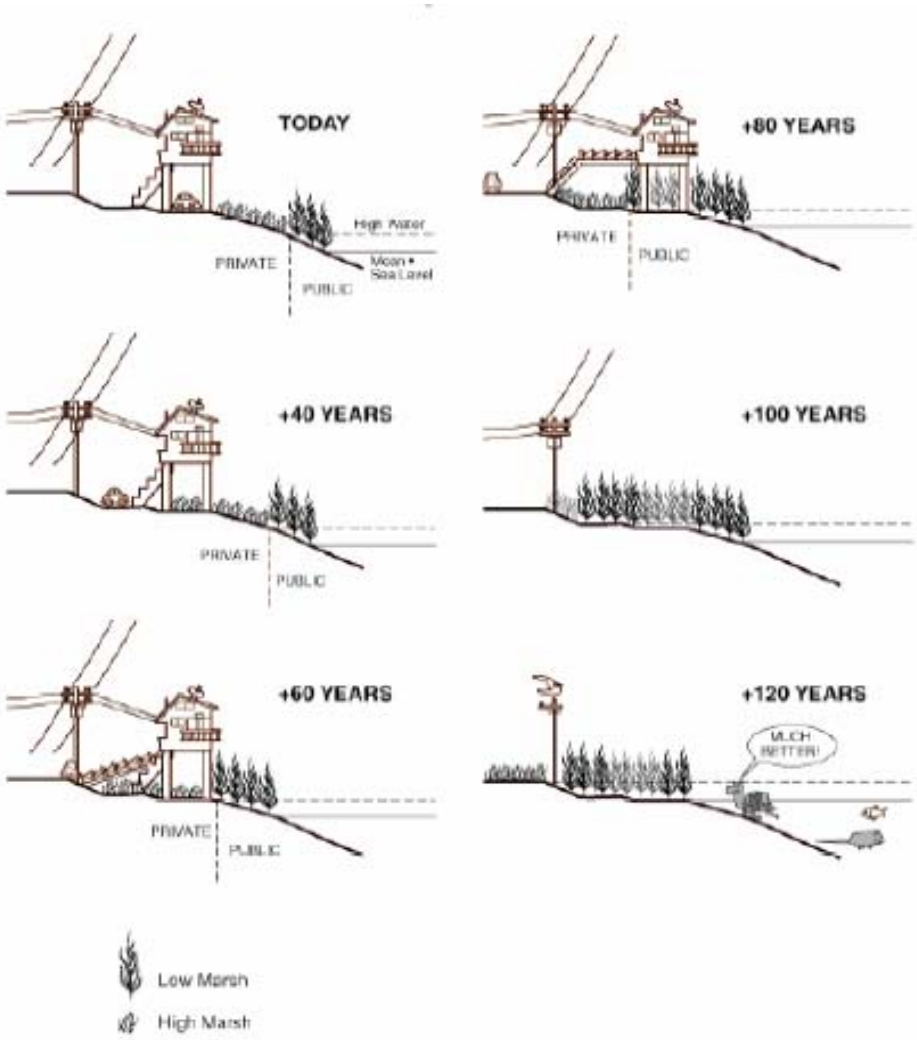
EPA's TMDL program allocates pollutant loads to water bodies

Publicly-Owned Treatment Works (POTW)

Climate change could increase annual POTW treatment costs in Great Lakes Region

- by $7-$86 million
- on impaired stream and river reaches
- further widening gap between funds needed for POTWs and funds available

Category 4: Preventing Foreclosure of Future Options: Rolling Easements and Sea Level Rise



Category 4: Preventing Foreclosure of Future Options: Combined Sewer Overflow

(preliminary results for Great Lakes Region)

- Climate change will likely increase the frequency and intensity of rainstorms.
- If combined sewer systems meet the EPA's CSO Control Policy design standard of 4 events per year:
  - climate change may result in failure to meet the standard
  - there could be an average of 334 events per year above the control policy's objectives across 220 communities
- Storage/treatment capacity would need to increase, thus increasing system costs.

Category 5: Potential Maladaptive Practices: Adaptation by Shipping Industry to Changes in Great Lakes Level Changes for Shipping

- Climate change will likely lower Great Lakes levels
- For each inch of draft lost, 1,000 foot ships must offload 270 tons of freight
- Options considered at Chicago Lake Levels Workshop:
  - Lengthen shipping season
  - **Dredging**
  - Shallower-draft ships
  - Shift to land transport

Consideration when adapting:

- *Does dredging exacerbate or ameliorate contaminated sediments?*
- *What other options are there?*
- *What are the consequences of each?*